Theory of partial differential equations MWF 9-9:50am CB343 Spring 2013 Instructor: Russell Brown Office: POT741 Phone: 257-3951 russell.brown@uky.edu Office Hours: MWF 10-11 and by appointment.

Homework 7, due on 22 April 2013.

1. Let $L = -\sum_{i,j=1}^{n} D_{x_i} a_{ij} D_{x_j} u$. Fix *m* in the set $\{1, \ldots, n\}$ and let *u* be a weak solution of Lu = 0. If *u* lies in the Sobolev space $W^{2,2}(U)$ and the coefficients a_{ij} lie in the space $C^2(\bar{U})$, show that $v = D_{x_m} u$ satisfies an equation of the form Lv = F. Find *F*.

Hint: Consider test functions of the form $D_{x_m}\phi$ and recall what we know about the product rule for weak derivatives.

- 2. Evans p. 446, #2. Hint: Remember the characterization of λ_1 using the Rayleigh quotient.
- 3. Evans p. 446, #4. Describe carefully the assumptions on $\{w_k\}_k$ that are needed. Try to give the best set of assumptions.

April 17, 2013